FIG. 1

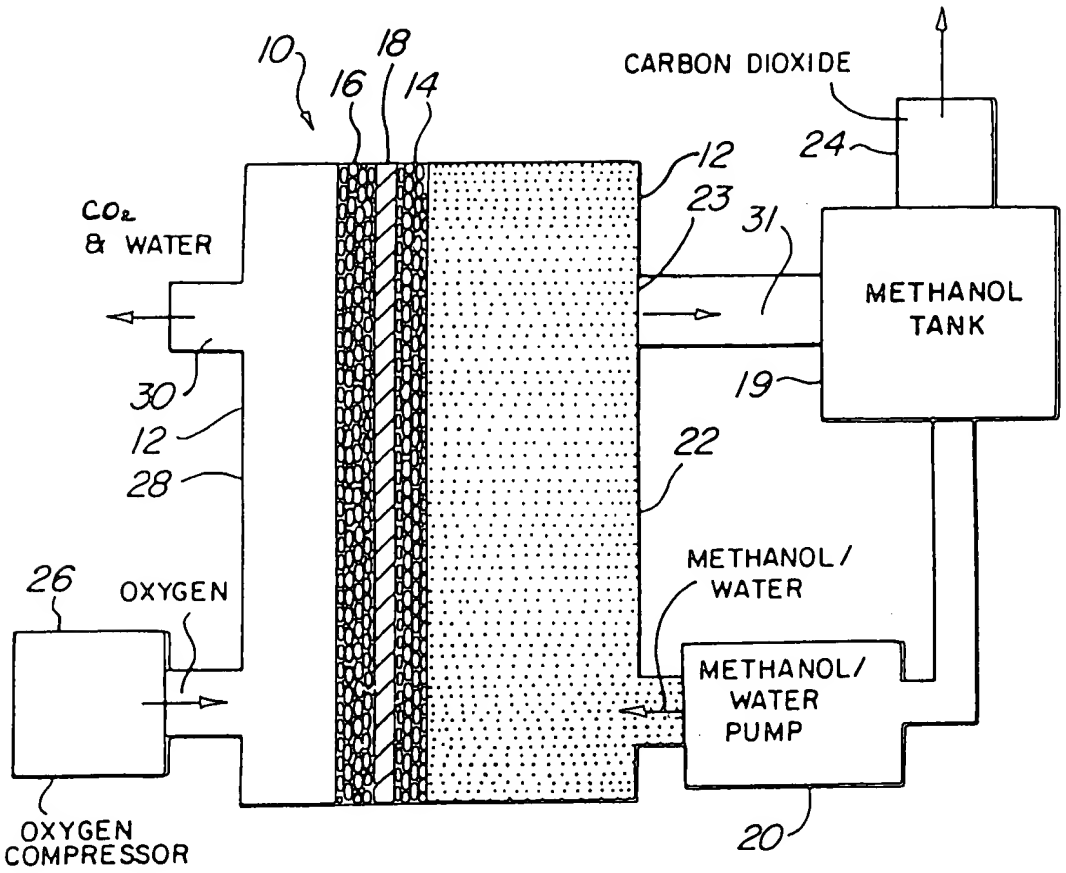
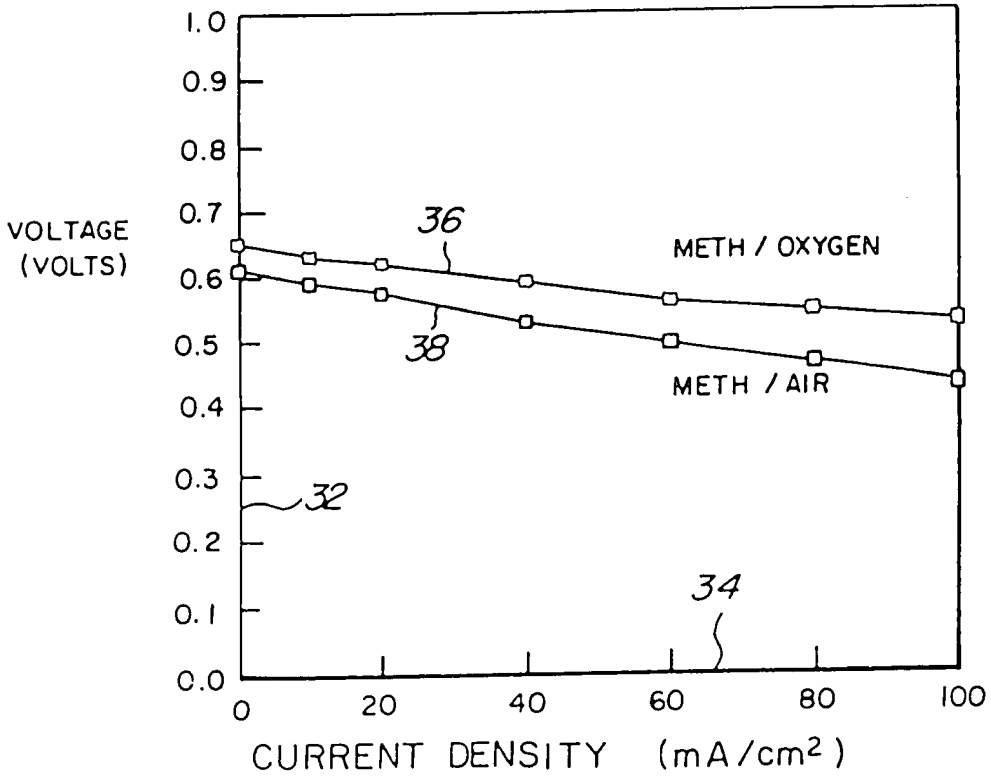

10
18
16
14
CARBON DIOXIDE
24
12
23
31
CO_2
& WATER
METHANOL
TANK
30
19
12
22
28
METHANOL/
WATER
26
OXYGEN
METHANOL/
WATER
PUMP
OXYGEN
COMPRESSOR
20

FIG. 4


1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
VOLTAGE
(VOLTS)
36
METH / OXYGEN
38
METH / AIR
32
34
0
20
40
60
80
100
CURRENT DENSITY (mA/cm²)

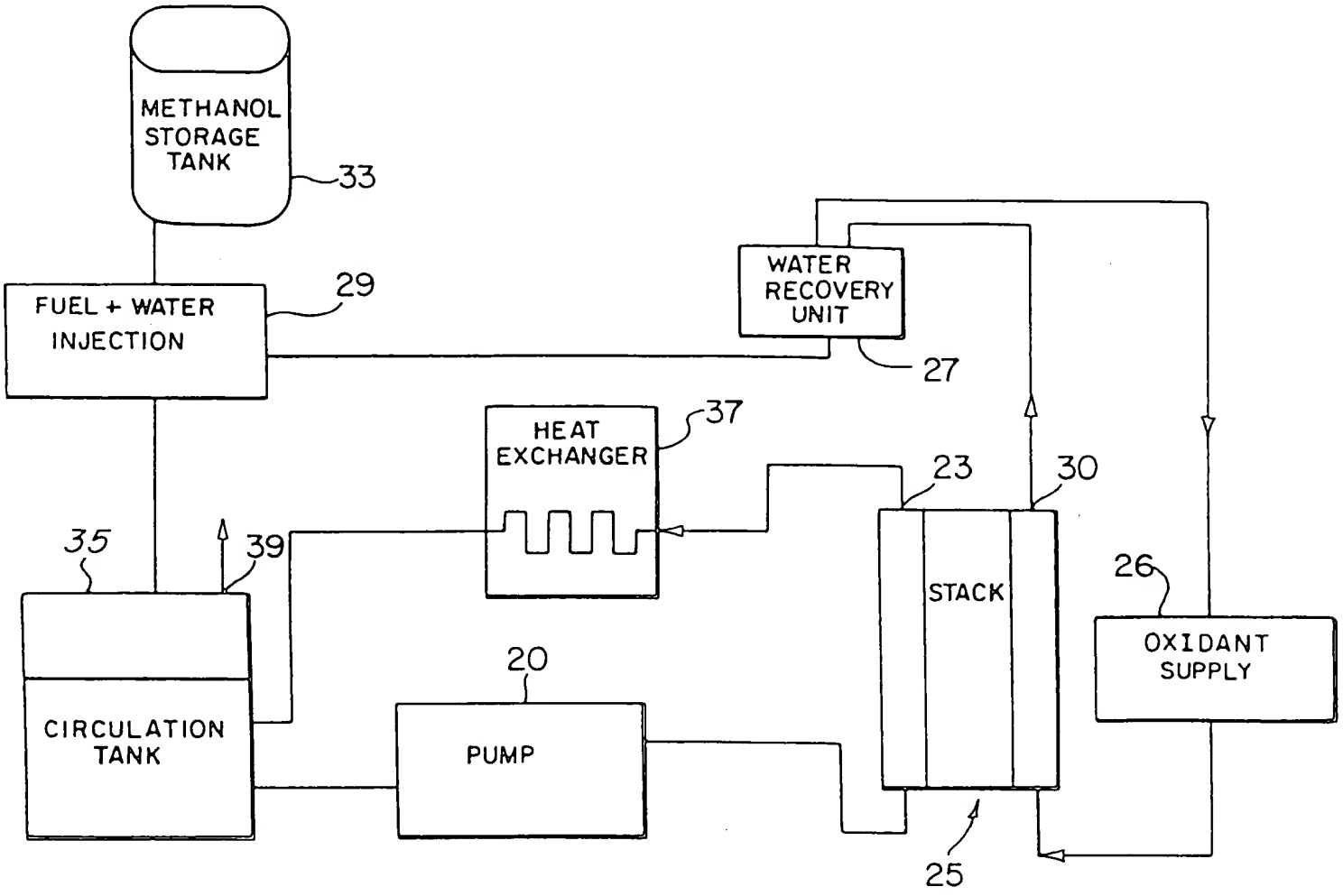


FIG. 2

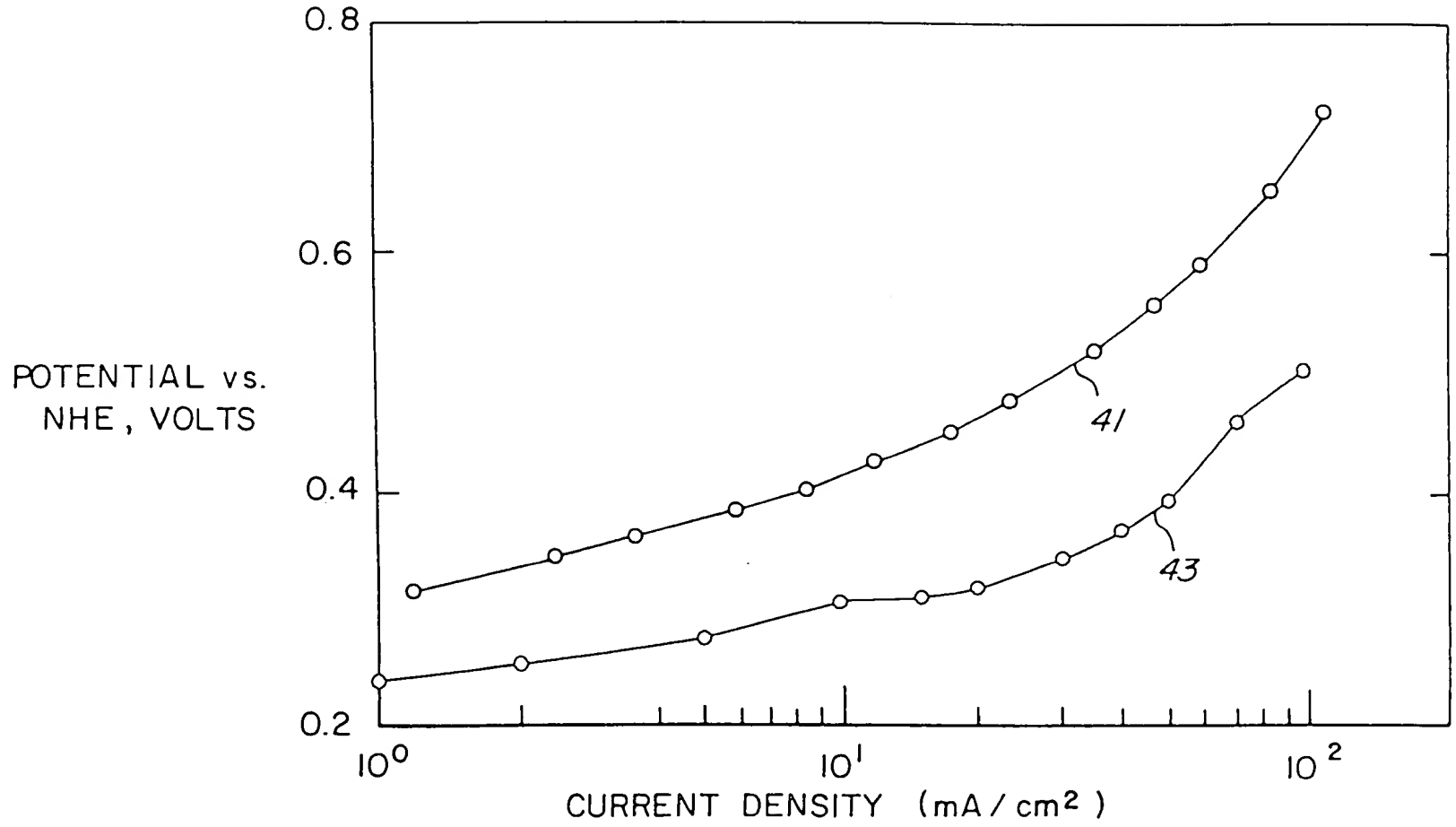

0.8
0.6
0.4
0.2
POTENTIAL vs.
NHE, VOLTS
41
43
10^0
10^1
10^2
CURRENT DENSITY (mA / cm²)

FIG. 3

FIG. 5

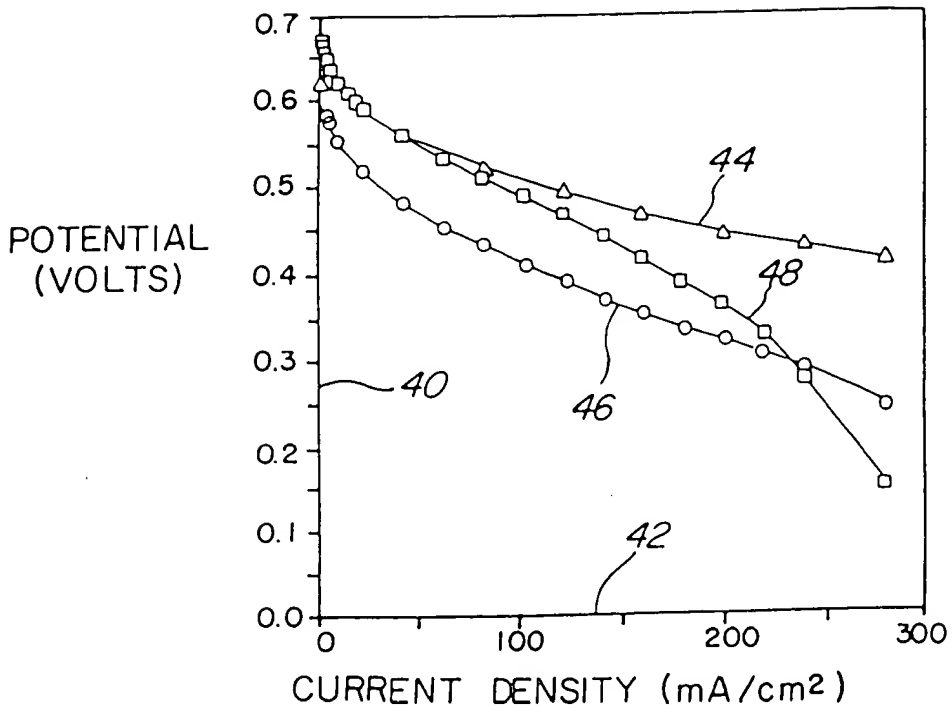
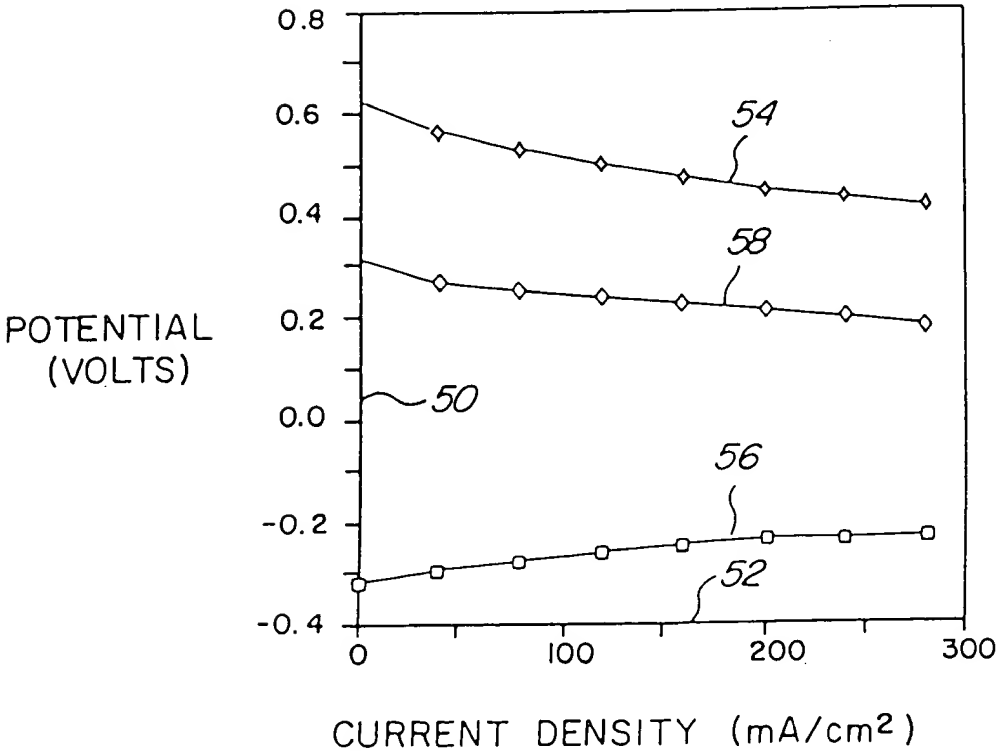

POTENTIAL
(VOLTS)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
100
200
300
CURRENT DENSITY (mA/cm2)
44
48
46
40
42

FIG. 6


POTENTIAL
(VOLTS)
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
0
100
200
300
CURRENT DENSITY (mA/cm2)
54
58
50
56
52

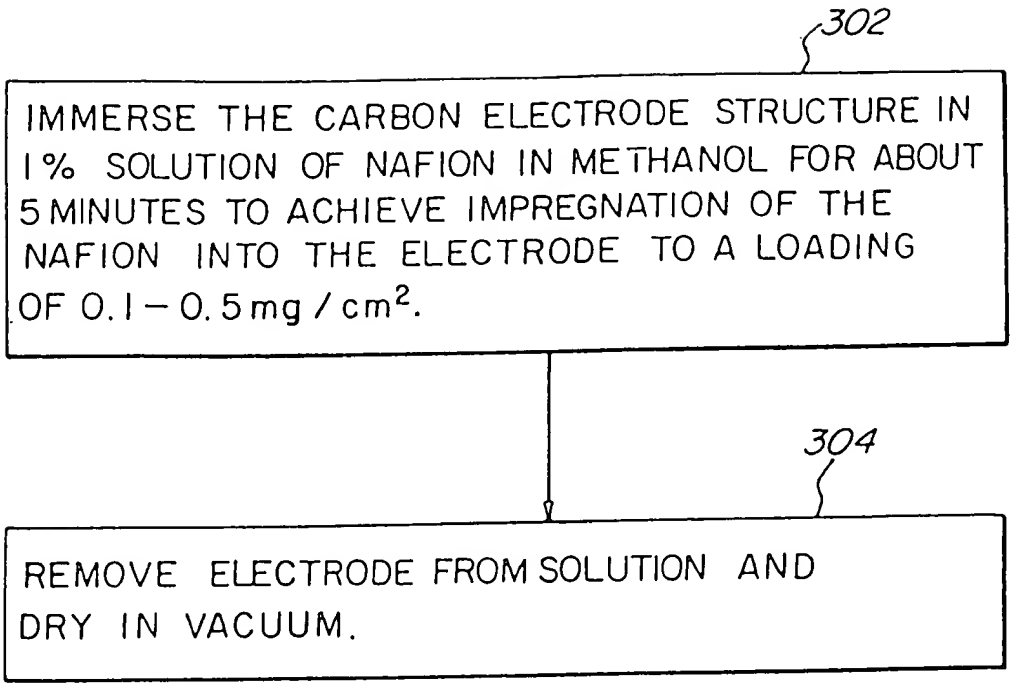

302
IMMERSE THE CARBON ELECTRODE STRUCTURE IN 1% SOLUTION OF NAFION IN METHANOL FOR ABOUT 5 MINUTES TO ACHIEVE IMPREGNATION OF THE NAFION INTO THE ELECTRODE TO A LOADING OF 0.1 – 0.5 mg / cm2.
304
REMOVE ELECTRODE FROM SOLUTION AND DRY IN VACUUM.

FIG. 7

FIG. 11

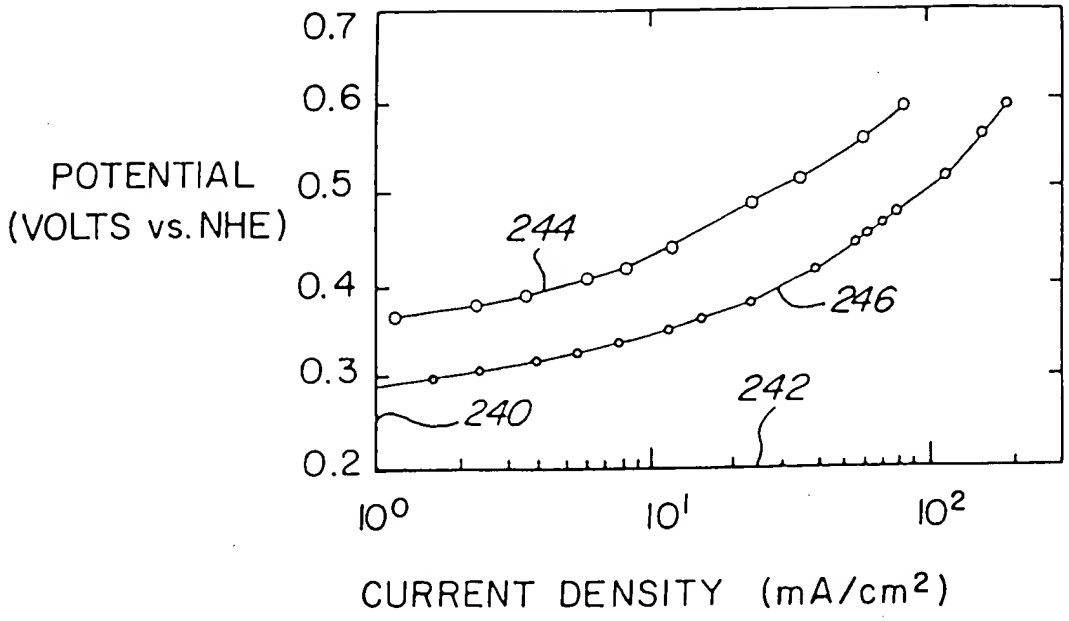
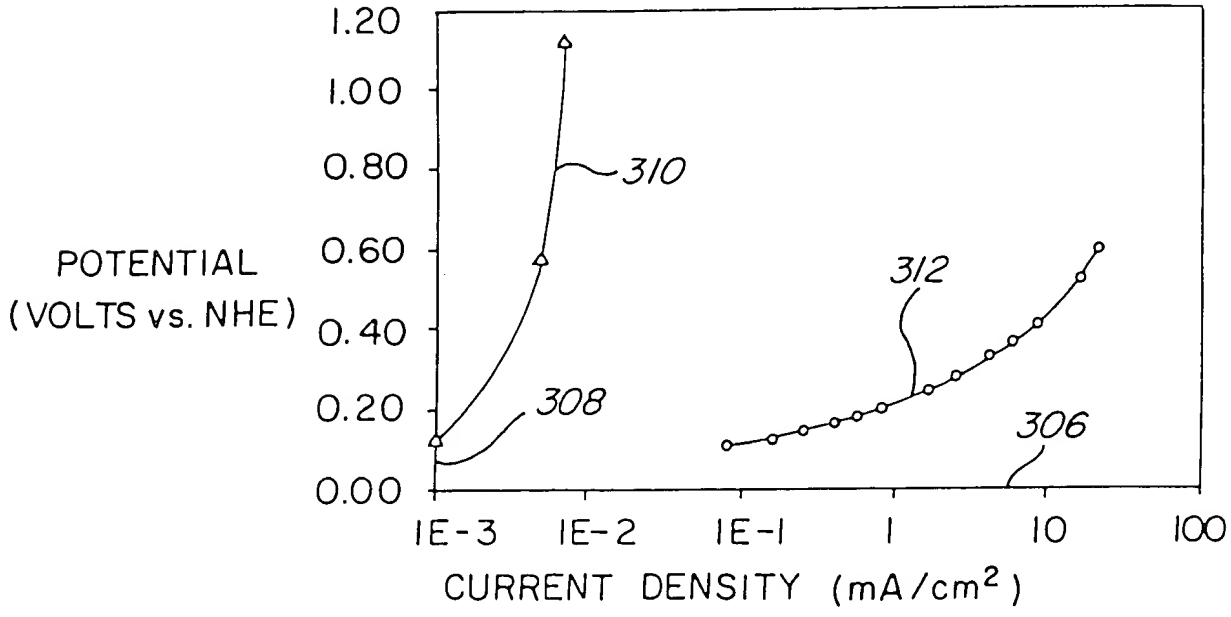

0.7
0.6
0.5
0.4
0.3
0.2
POTENTIAL
(VOLTS vs. NHE)
244
246
242
240
10^0
10^1
10^2
CURRENT DENSITY (mA/cm²)

FIG. 8


1.20
1.00
0.80
0.60
0.40
0.20
0.00
POTENTIAL
(VOLTS vs. NHE)
310
312
308
306
IE-3
IE-2
IE-1
1
10
100
CURRENT DENSITY (mA/cm²)

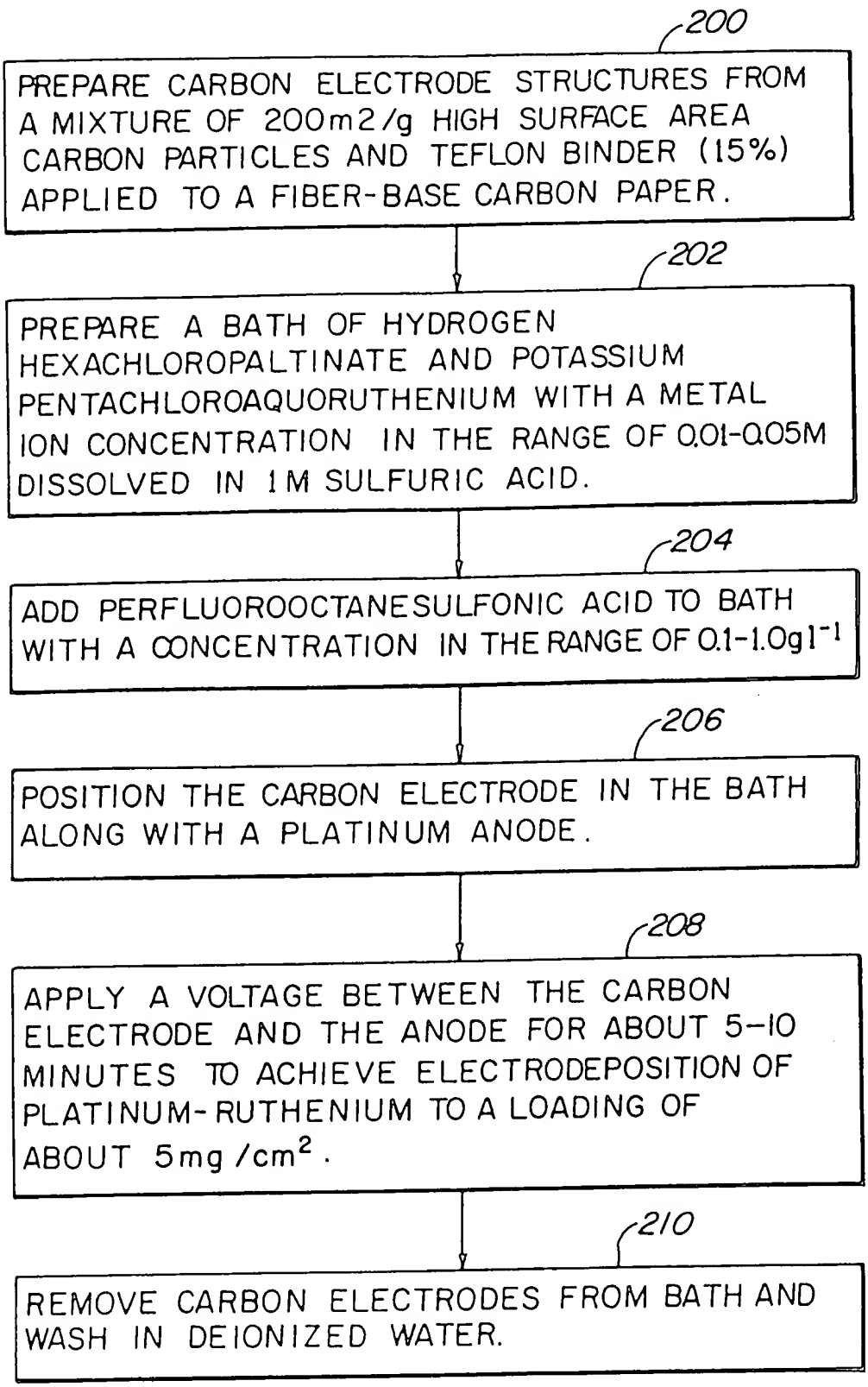
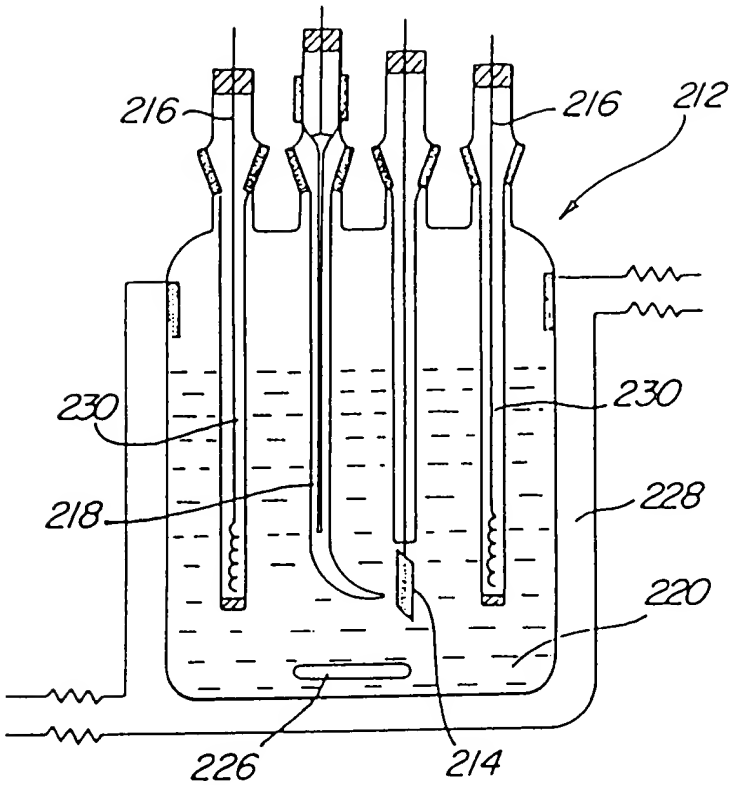

200
PREPARE CARBON ELECTRODE STRUCTURES FROM A MIXTURE OF 200m2/g HIGH SURFACE AREA CARBON PARTICLES AND TEFLON BINDER (15%) APPLIED TO A FIBER-BASE CARBON PAPER.
202
PREPARE A BATH OF HYDROGEN HEXACHLOROPALTINATE AND POTASSIUM PENTACHLOROAQUORUTHENIUM WITH A METAL ION CONCENTRATION IN THE RANGE OF 0.01-0.05M DISSOLVED IN 1M SULFURIC ACID.
204
ADD PERFLUOROOCTANESULFONIC ACID TO BATH WITH A CONCENTRATION IN THE RANGE OF 0.1-1.0g1^{-1}
206
POSITION THE CARBON ELECTRODE IN THE BATH ALONG WITH A PLATINUM ANODE.
208
APPLY A VOLTAGE BETWEEN THE CARBON ELECTRODE AND THE ANODE FOR ABOUT 5-10 MINUTES TO ACHIEVE ELECTRODEPOSITION OF PLATINUM-RUTHENIUM TO A LOADING OF ABOUT 5mg/cm^2.
210
REMOVE CARBON ELECTRODES FROM BATH AND WASH IN DEIONIZED WATER.

FIG. 9

FIG. 10



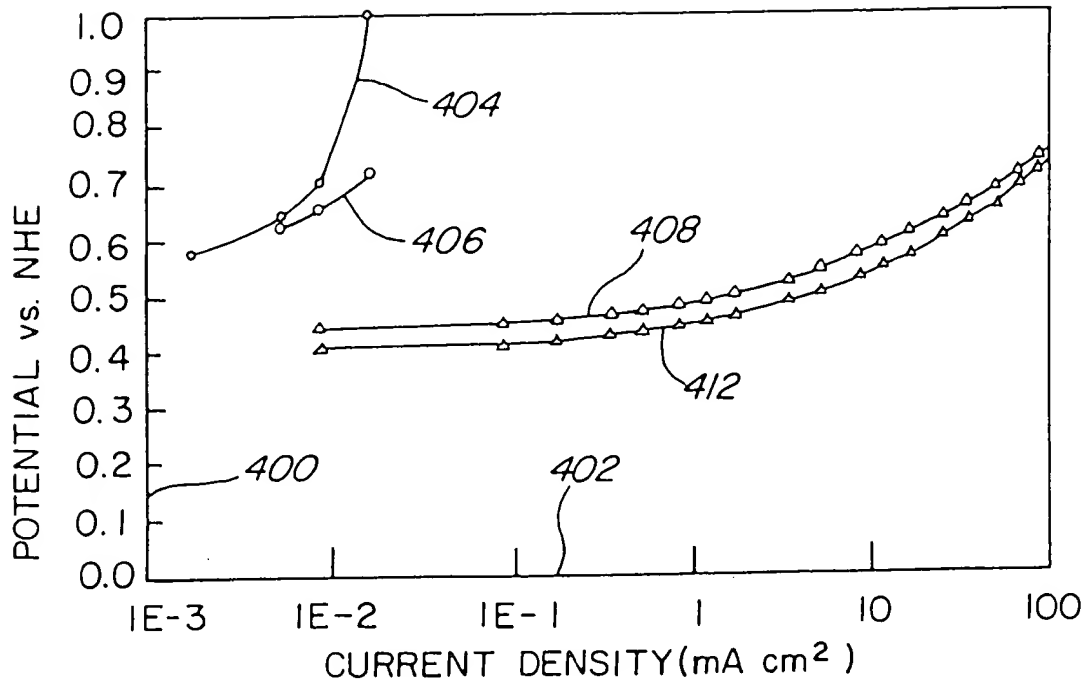

1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
POTENTIAL vs. NHE
404
406
408
412
400
402
IE-3
IE-2
IE-1
1
10
100
CURRENT DENSITY(mA cm2)

FIG. 12

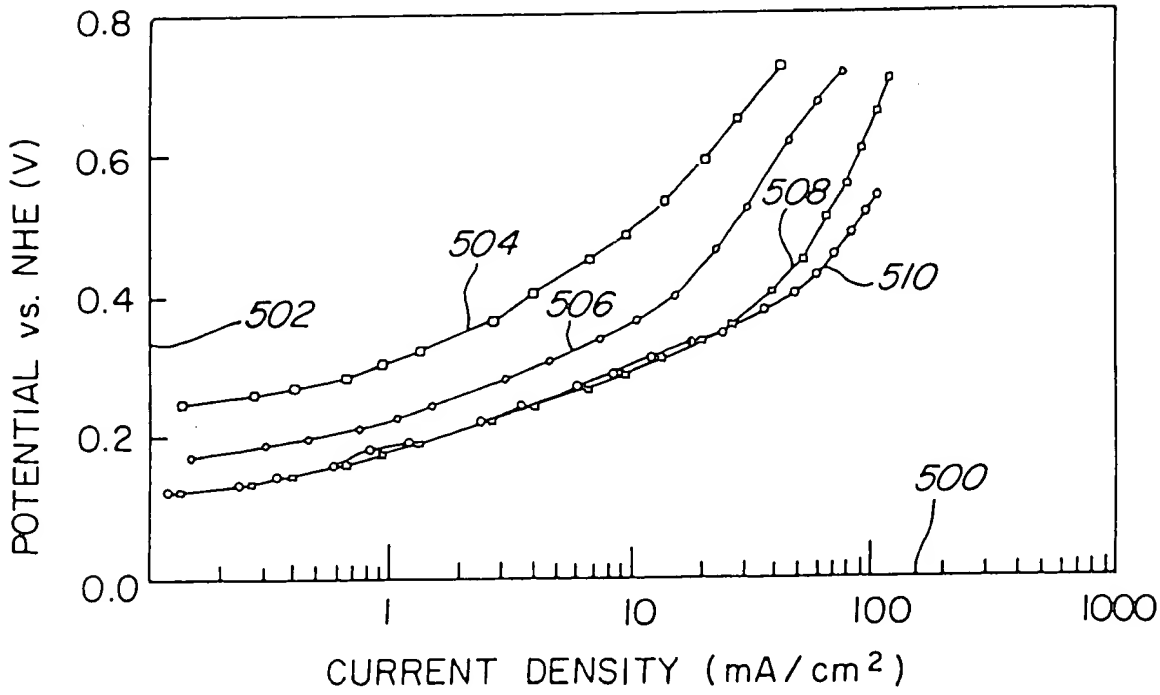

0.8
0.6
0.4
0.2
0.0
POTENTIAL vs. NHE (V)
502
504
506
508
510
500
1
10
100
1000
CURRENT DENSITY (mA/cm2)

FIG. 13

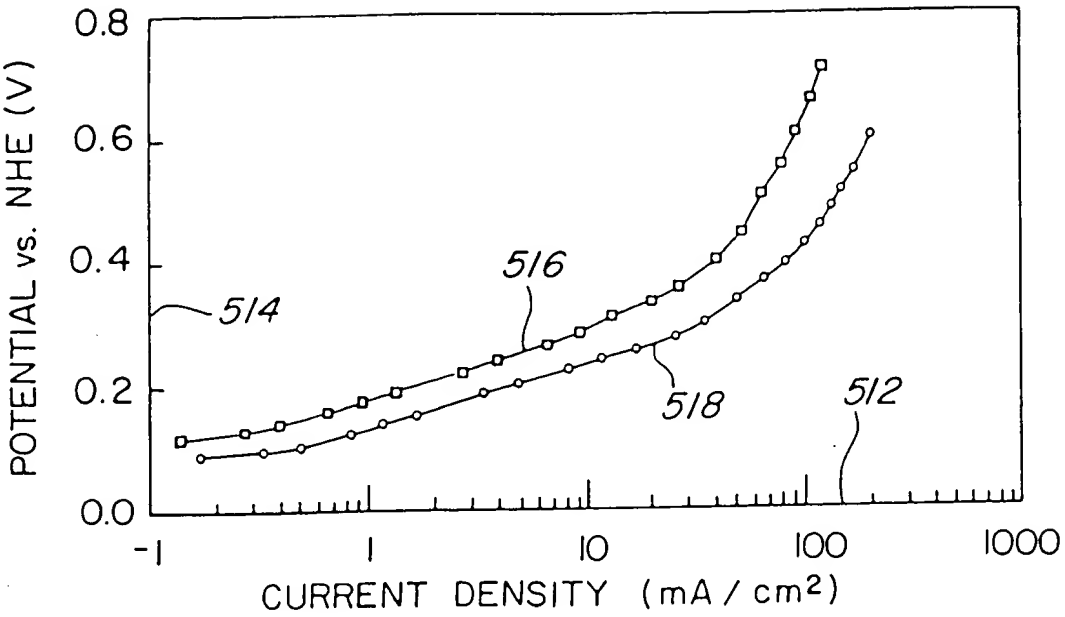

POTENTIAL vs. NHE (V)
0.8
0.6
0.4
0.2
0.0
514
516
518
512
-1
1
10
100
1000
CURRENT DENSITY (mA / cm2)

FIG. 14

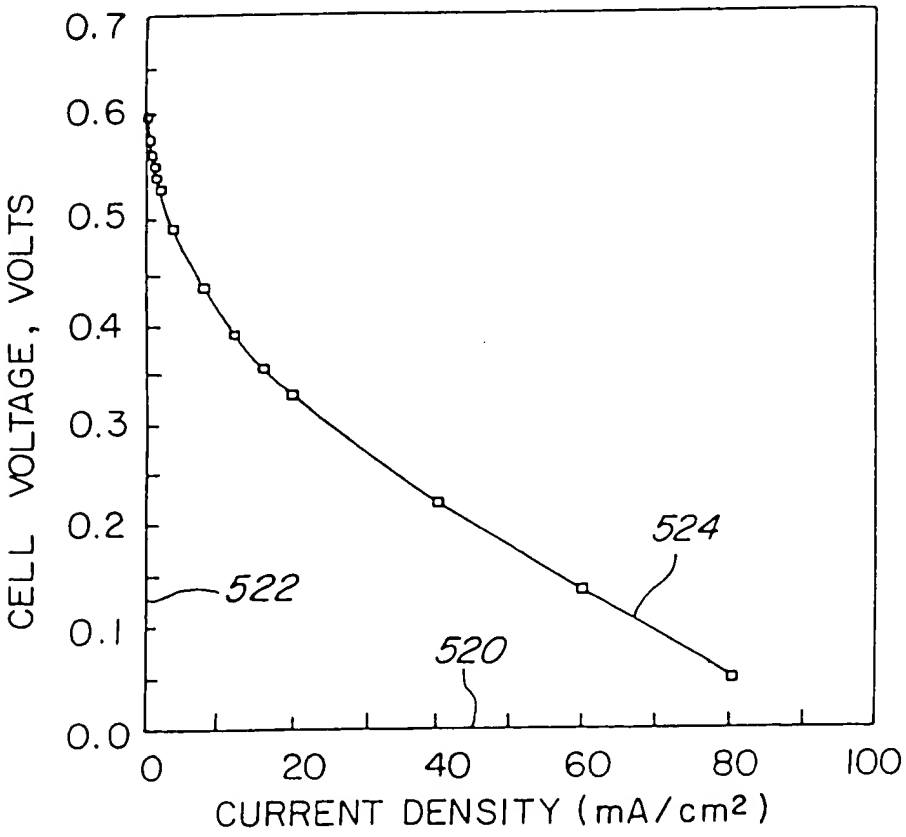

CELL VOLTAGE, VOLTS
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
522
524
520
0
20
40
60
80
100
CURRENT DENSITY (mA/cm2)

FIG. 15

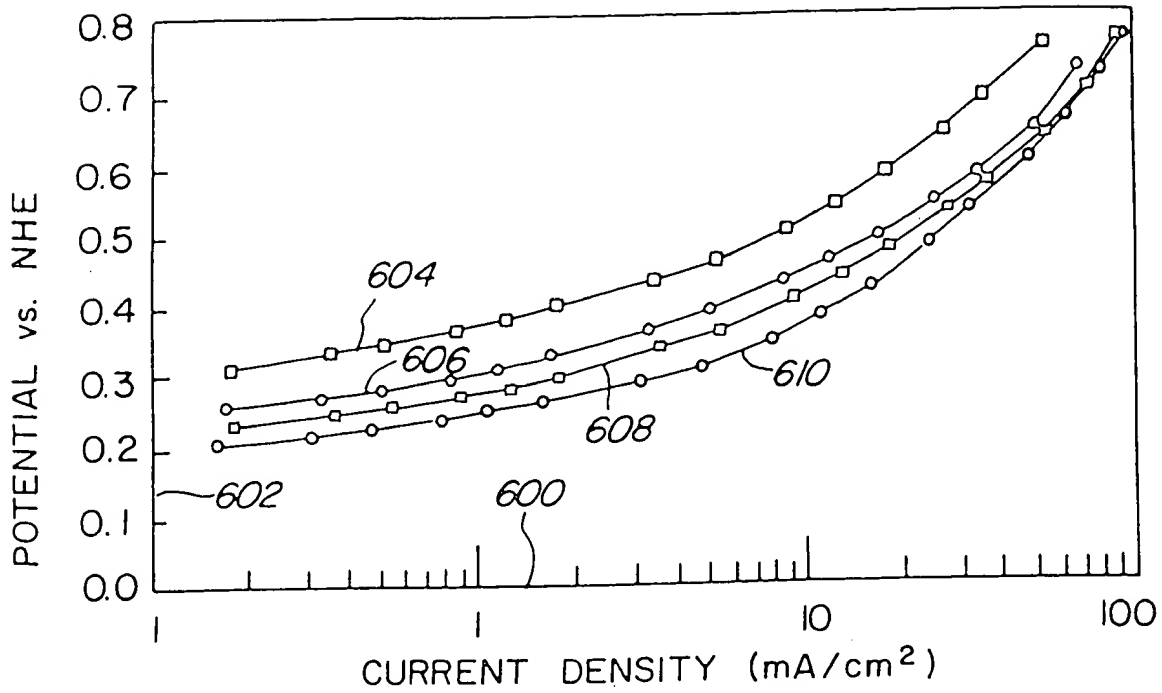

POTENTIAL vs. NHE
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
604
606
608
610
602
600
1
1
10
100
CURRENT DENSITY (mA/cm²)

FIG. 16

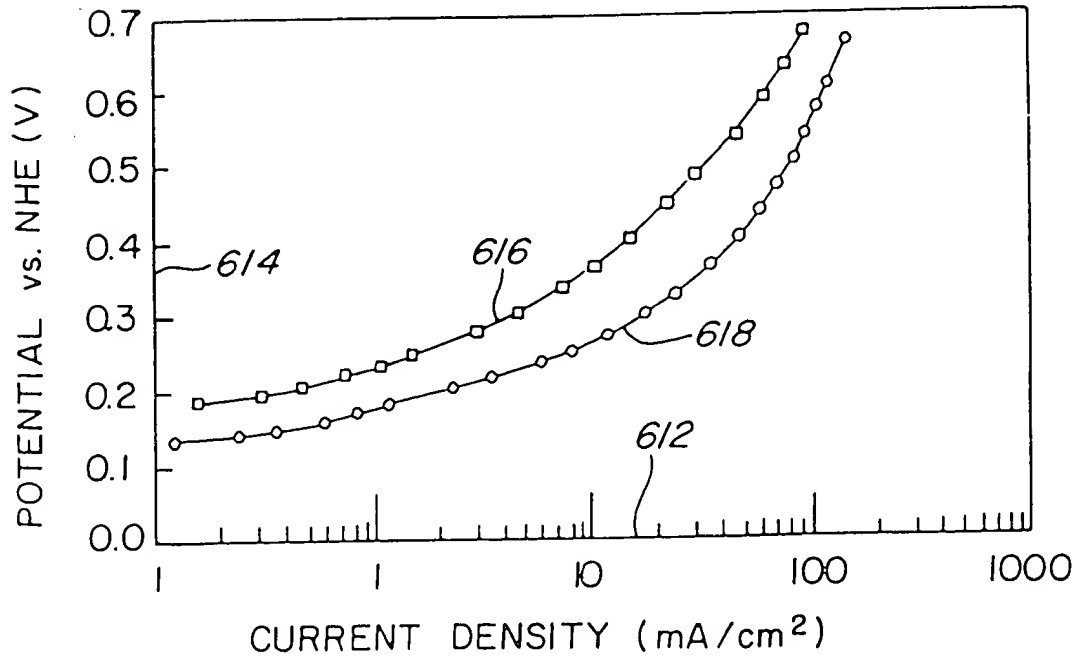

POTENTIAL vs. NHE (V)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
614
616
618
612
1
1
10
100
1000
CURRENT DENSITY (mA/cm²)

FIG. 17

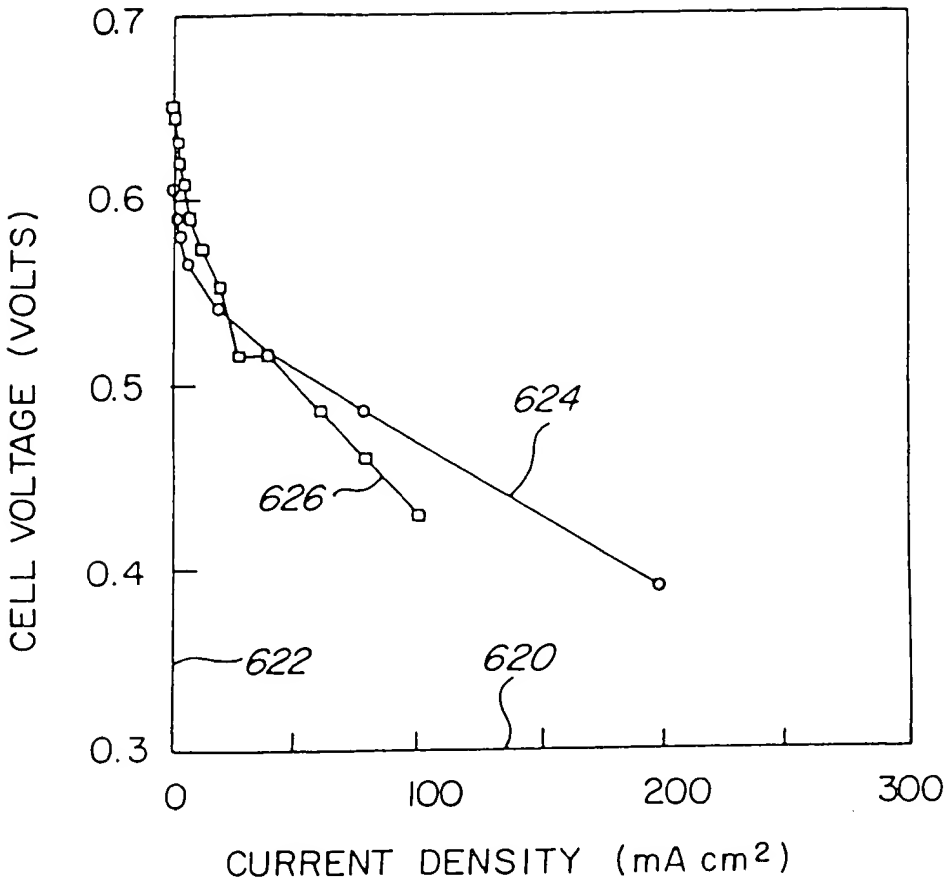

0.7
0.6
0.5
0.4
0.3
CELL VOLTAGE (VOLTS)
624
626
622
620
0
100
200
300
CURRENT DENSITY (mA cm²)

FIG. 18

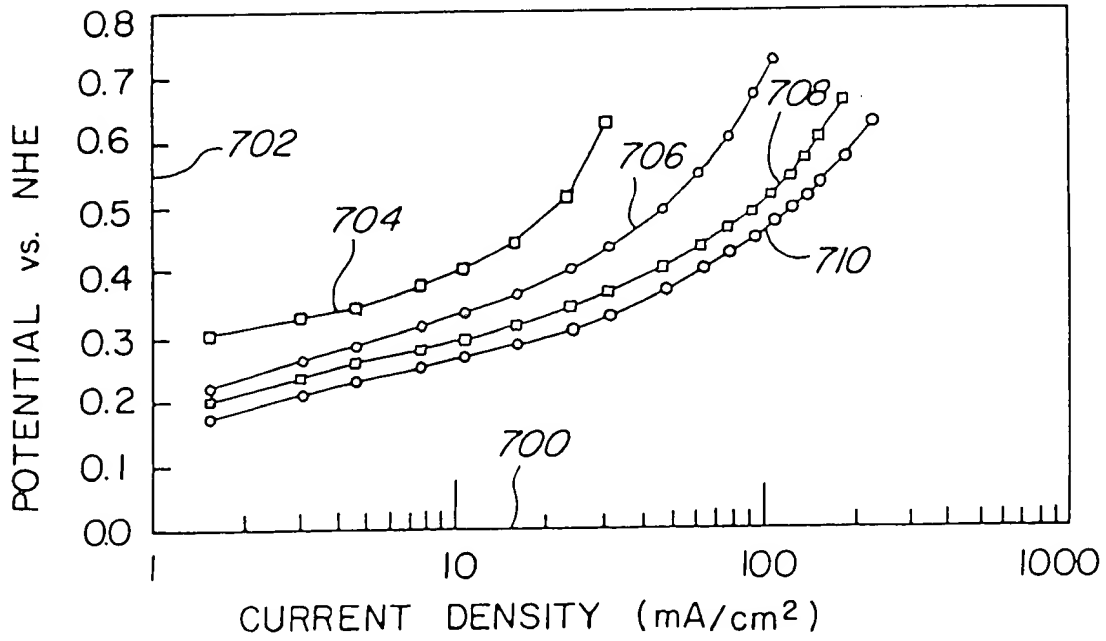

0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
POTENTIAL vs. NHE
702
704
706
708
710
700
1
10
100
1000
CURRENT DENSITY (mA/cm²)

FIG. 19

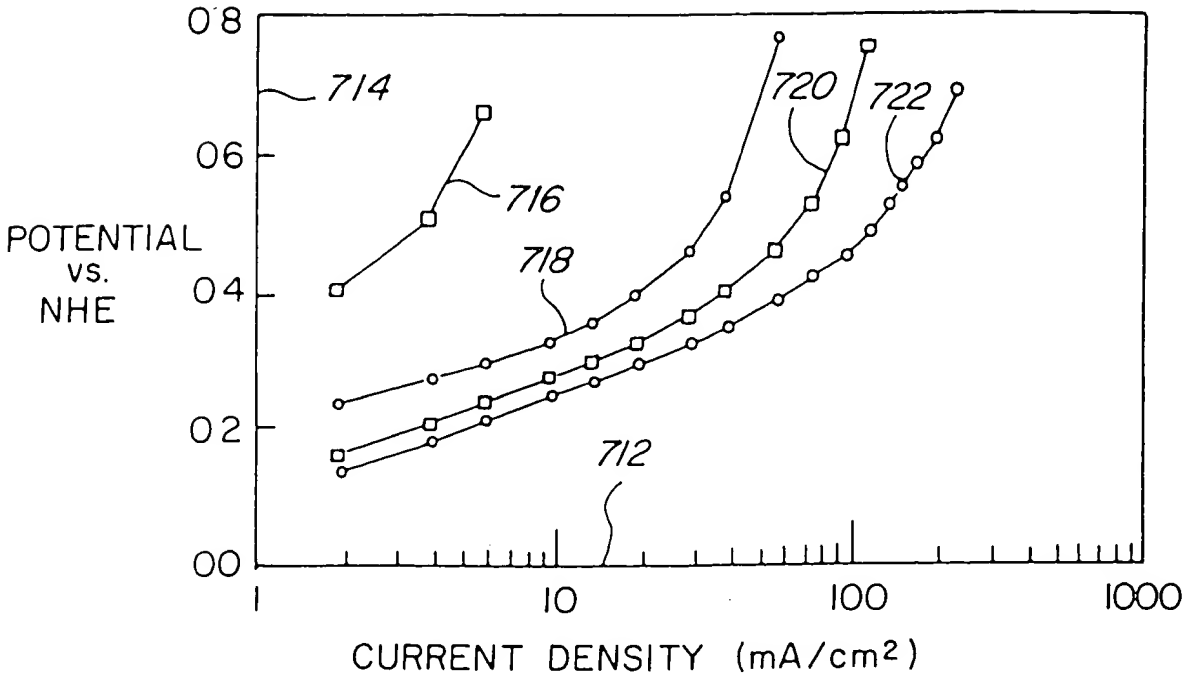

0.8
0.6
0.4
0.2
0.0
POTENTIAL
vs.
NHE
714
716
718
720
722
712
1
10
100
1000
CURRENT DENSITY (mA/cm²)

FIG. 20

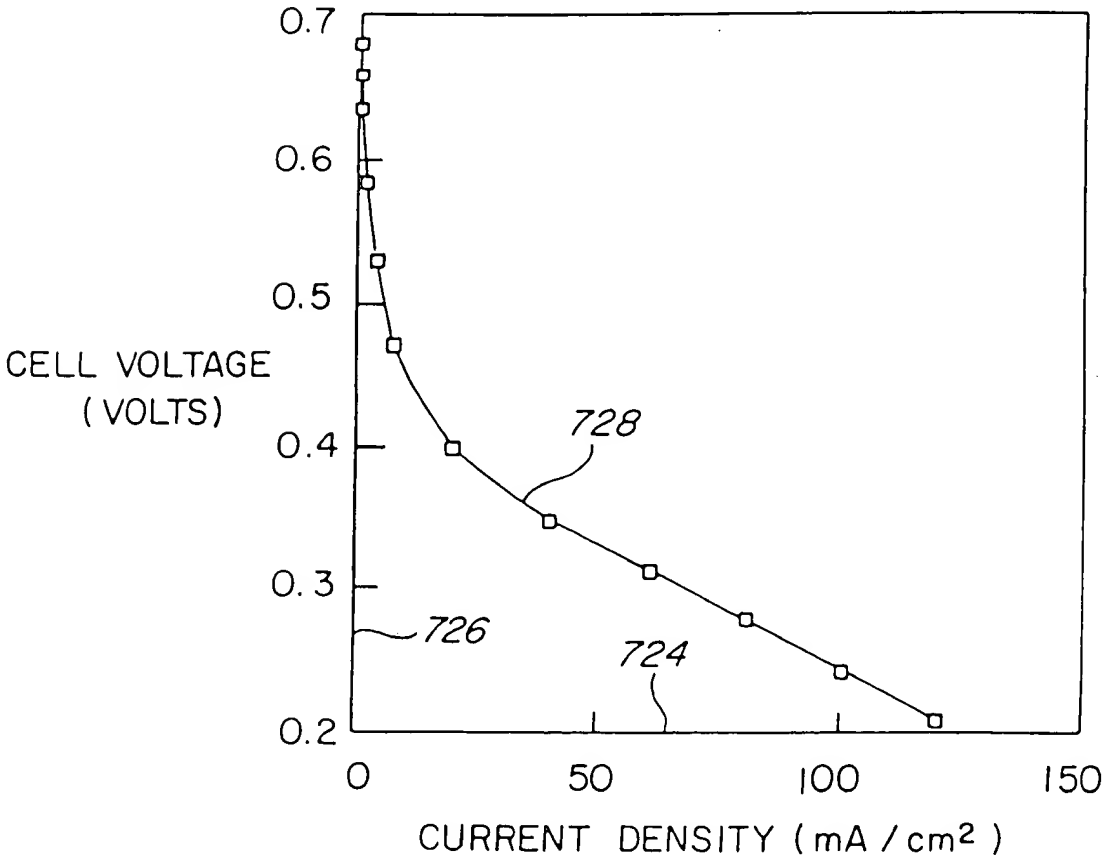

0.7
0.6
0.5
0.4
0.3
0.2
CELL VOLTAGE
(VOLTS)
728
726
724
0
50
100
150
CURRENT DENSITY (mA/cm²)

FIG. 21